

**NASA Glenn
Plum Brook Station**

Health & Safety First

This is one in a series of fact sheets prepared by NASA Glenn Research Center to provide the public with information on decommissioning the closed Reactor Facility at Plum Brook Station.

Concern for safety is the principle that guides NASA through every stage of planning and implementing the Reactor Facility Decommissioning. There are no compromises when it comes to protecting the health and safety of the public, the workers and the environment - it's NASA's number one priority. Careful attention to worker health and safety is also the first line of assurance that people "outside the fence" and the environment will remain safe.



Workers replaced ladders with stairways into the quadrants to minimize the potential for trips and falls.

All Hazards Considered

While radiation safety is a priority for NASA, experience from other decommissioning projects has shown there are other safety issues of primary concern. On construction sites or in industrial settings, there always exists the potential for occupational hazards from large machinery, excessive heat or noise, chemicals, etc., that could result in injuries (such as trips, falls and cuts). NASA's comprehensive Health and Safety Program addresses these potential hazards in the workplace and puts safeguards into place before any work begins. NASA pays strict attention to safety while work is in progress, taking precautions to protect workers from all occupational hazards including radiation exposure.

Advanced Planning for Safety

Decommissioning is often referred to as "construction in reverse" because it involves taking apart the Reactor Facility piece by piece. It is made up of many detailed procedures and specially sequenced jobs - surveying items, setting up staging areas, dismantling equipment, decontaminating materials and operating cranes, to name just a few. NASA conducts a thorough Safety Review before any job begins to look at every step involved in performing that job and its potential hazards. Using Safety Review results, NASA addresses potential hazards and provides detailed work procedures to eliminate the hazards and get the job done safely.

Radiation Safety Program

Not every decommissioning task involves dealing with radiation. If a potential radiation hazard is identified during the Safety Review, a Radiation Work Permit (RWP) is developed that specifies preventive measures that NASA will take to eliminate or minimize the potential exposure.

ALARA - As Low As Reasonably Achievable is the industry standard and the foundation on which NASA builds its comprehensive Radiation Safety Program. NASA meets or exceeds the ALARA standard when planning and implementing every job. Before any job begins, NASA determines:

What the radiation risks are

What the exposure levels will be

How to minimize radiation risks using engineering and administrative controls, including personal protective equipment.

ALARA - As Low As Reasonably Achievable

Minimize radiation exposures to workers and others entering a controlled area; and

Make deliberate efforts to reduce radiation exposures to as low as reasonably achievable taking into account social, technical, economic, practical and public policy considerations.

All of us are exposed to radiation all the time. Over 80% of our exposure comes from natural sources such as:

radon gas
in the air

atoms
in the earth's
rocks and soil

cosmic rays
from the sun

food & water

Safety from the Start **Minimizing & Monitoring Exposure**

NASA pays strict attention to each worker's radiation levels - establishing a baseline at the start of employment and regularly checking for accumulated dose, if any, during decommissioning.

Internal exposure occurs when radioactive materials (usually alpha or beta particles) are taken into the body by eating, drinking, breathing, or through breaks in the skin. NASA measures a new worker's internal dose using a bioassay to determine the types and quantities of isotopes that are present in his body (from natural sources and from any intakes from previous radiation work). NASA tracks each worker's internal dose by repeating the bioassay each year (annual), if a specific exposure occurs (event), and when the worker leaves or when decommissioning is complete (final).

NASA Maintains Levels Well Below Regulatory Limits

Internal NASA uses a combination of engineering and administrative controls to ensure a worker's internal dose is minimized and remains well below regulatory limits.

- Respiratory protection - a worker is equipped and trained in the use of a full-face respirator when work in areas with airborne radioactivity is necessary.
- Protective clothing - a worker wears coveralls, boots, a hardhat, gloves, and eye protection.
- Air contaminants are filtered using installed process and local ventilation systems with HEPA (High Efficiency Particulate Air) filters that are 99.97% effective in capturing dust to as small as 0.3 microns.
- A policy of no eating, drinking, smoking or applying of cosmetics is enforced in the work area.

External **External exposure** occurs when radiation (usually x-rays and gamma rays) penetrates the body. NASA measures each worker's external dose using personal dosimetry, a small device that is worn on the body. Each worker's monthly and cumulative external dose is reported to both the worker and the Nuclear Regulatory Commission (NRC).

NASA follows three basic guidelines for keeping a worker's external dose to a minimum and well below regulatory limits.

- **Time** Even though a worker is properly outfitted with personal protective equipment, NASA limits the amount of time a worker may spend in a radioactive environment.
- **Distance** Radiation levels drop dramatically with greater distance from a radioactive source. To keep a worker as far away from a source and still perform effectively, remote handling devices (long poles holding cameras or mirrors), are used whenever possible.
- **Shielding** Placing physical barriers between the radioactive source and the worker blocks the ability for alpha, beta and gamma rays to reach the worker.



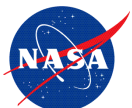
Working from a distance reduces exposure potential.

Ongoing Safety Training

Safety requires more than engineering controls. It takes a mindset shared by everyone involved in the project. Each worker's actions play an important part in ensuring that decommissioning will be conducted safely. NASA provides training for every worker including Occupational Health and Safety (OSHA) and Radiation Safety. For workers performing specialized jobs, NASA provides training, such as electrical safety and confined space safety. Initial training is followed up with annual refresher courses to continually reinforce NASA's commitment to safe workplace habits.

Safety to the Finish

NASA's focus on safety never wavers. It is this constant attention to detailed planning and commitment to safety throughout the project that contributes to the well being of its workers and the continued protection of the public and the environment.



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